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NAVAL AIR WARFARE CENTER

Air Combat Environment Test and Evaluation Facility (ACETEF) Support for Multi-sensor, Multi-spectral Sensor Fusion Testing

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NAWC-AD
Patuxent River, Md.



Outline



- Description of ACETEF
- Multi-Sensor/Multi-Spectral Sensor Fusion Testing Issues
- Example Applications
- Distributed Training and Test Applications
- Summary



Purpose of ACETEF



Purpose:

Test of installed avionics systems

Provide a realistic simulated environment

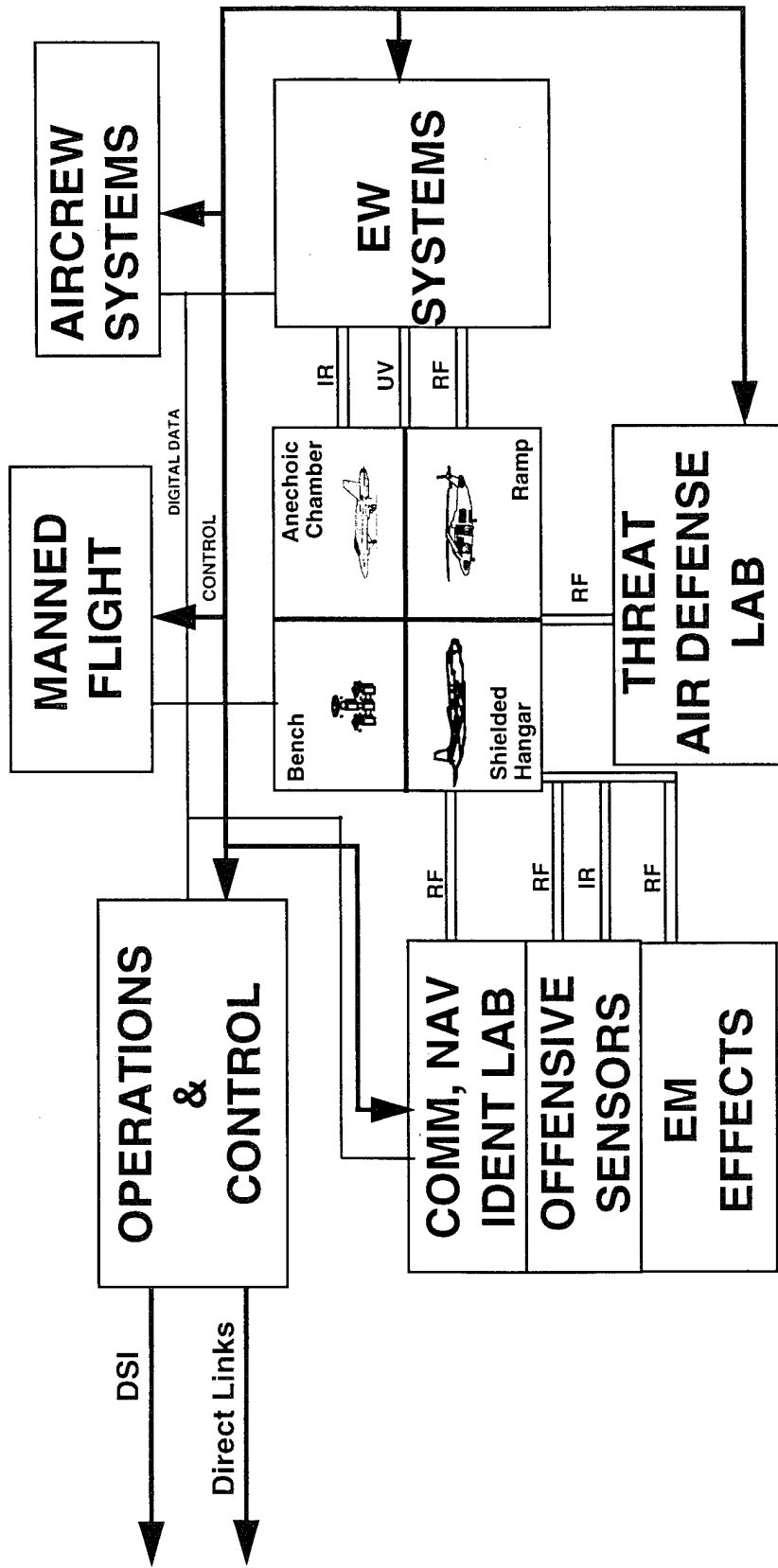
Provide ground test to complement flight test

Maximize platform test productivity

Reduce program risk!



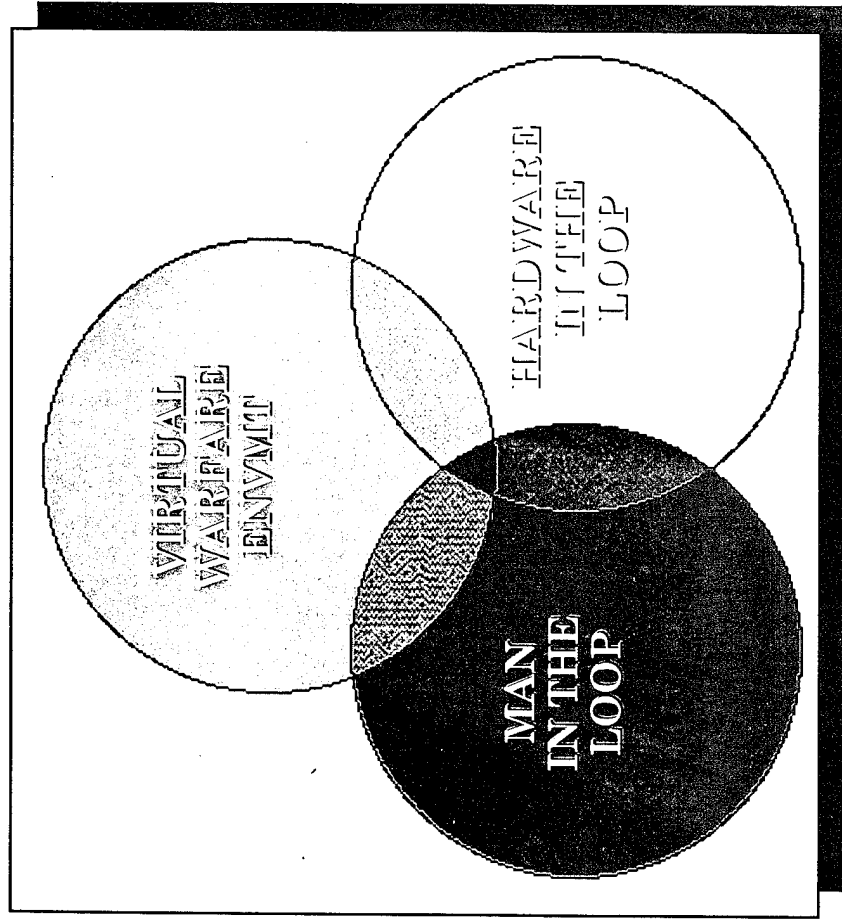
ACETEF ARCHITECTURE



- ☐ Warfare Simulation
- ☐ Man-in-the-Loop Simulation
- ☐ Hardware-in-the-Loop Simulation
- ☐ Installed Systems Test



ACETEF TEST ENVIRONMENT



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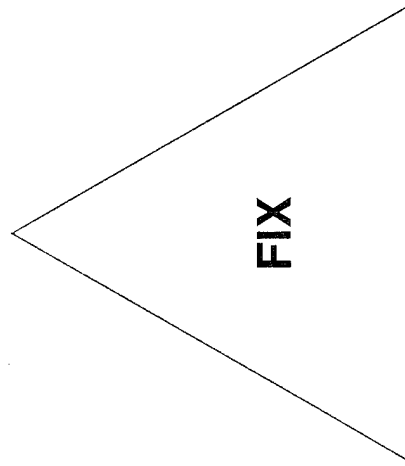
T&E METHODOLOGY



THE EVOLUTION OF T&E METHODOLOGY

1970's

FLY

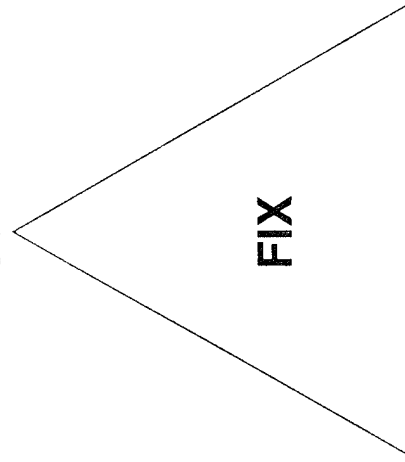


ANALYZE

FIX

1980's

FLY

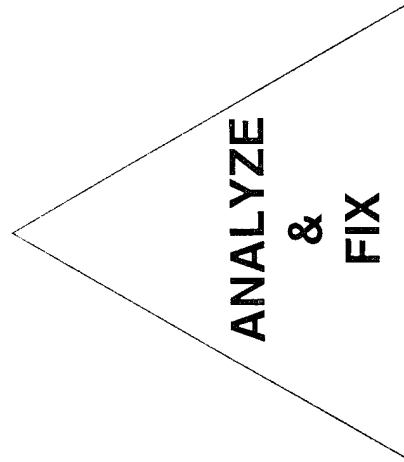


ANALYZE

SIMULATE

1990's

FLY



SIMULATE

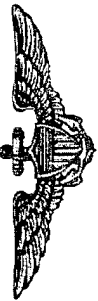
STIMULATE



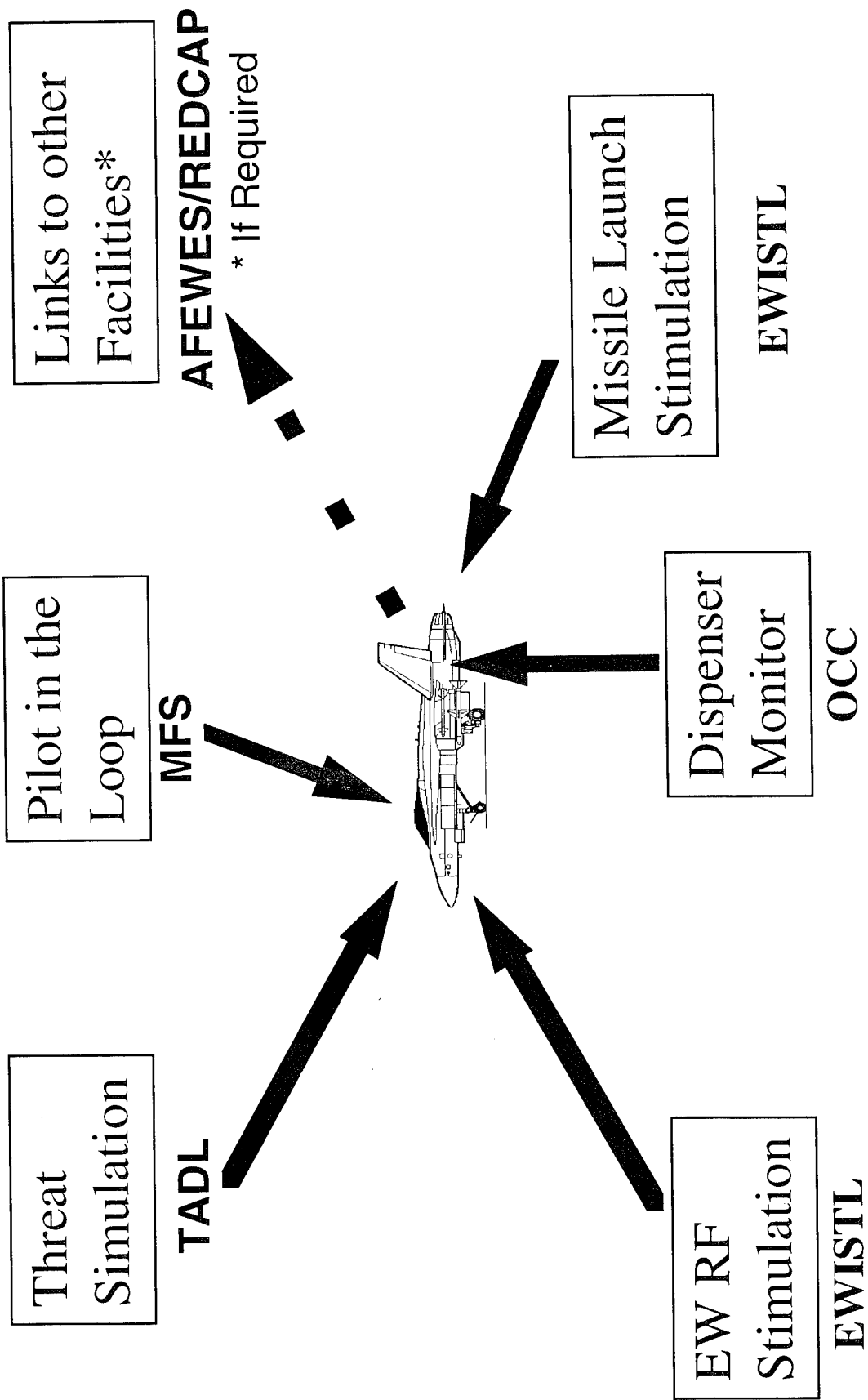
Testing Issues



- Realistic system under test loading
- Realistic “test” C4I Architectures/ Loading
- Realistic/varied background
- “Coherent Scenarios”
- Integration of Missile Warning and Countermeasures
- IR and Semi-active Missile Seeker end game testing.
- Highly dynamic scenarios
- Numbers/types of targets
- Coordination of Surveillance Assets
- Training/Calibration of Knowledge Based Algorithms vs testing

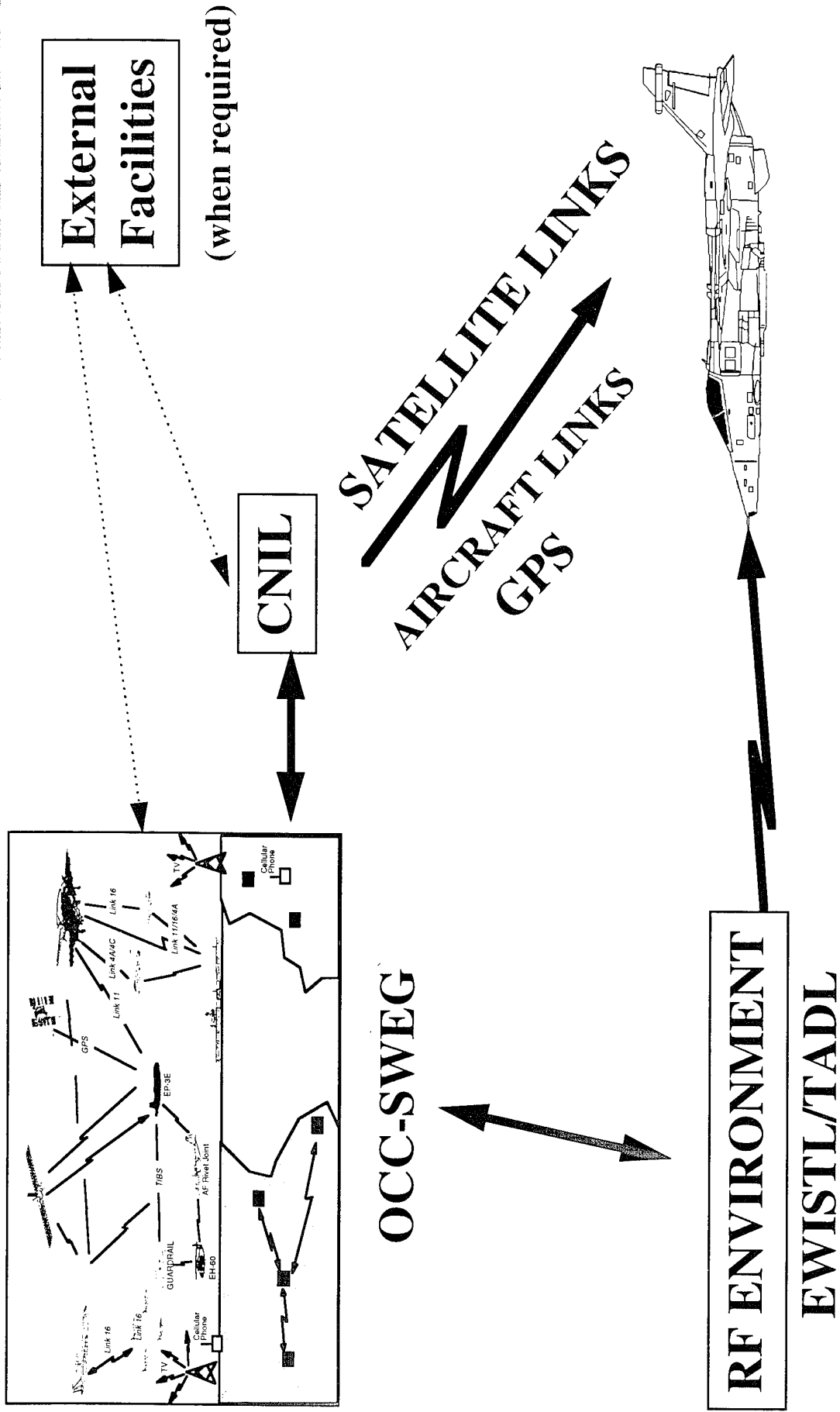


On-Board Defensive Multi-Sensor ACETEF Test Scenario





Defensive On-Board/Off-Board ACETEF Test Scenario

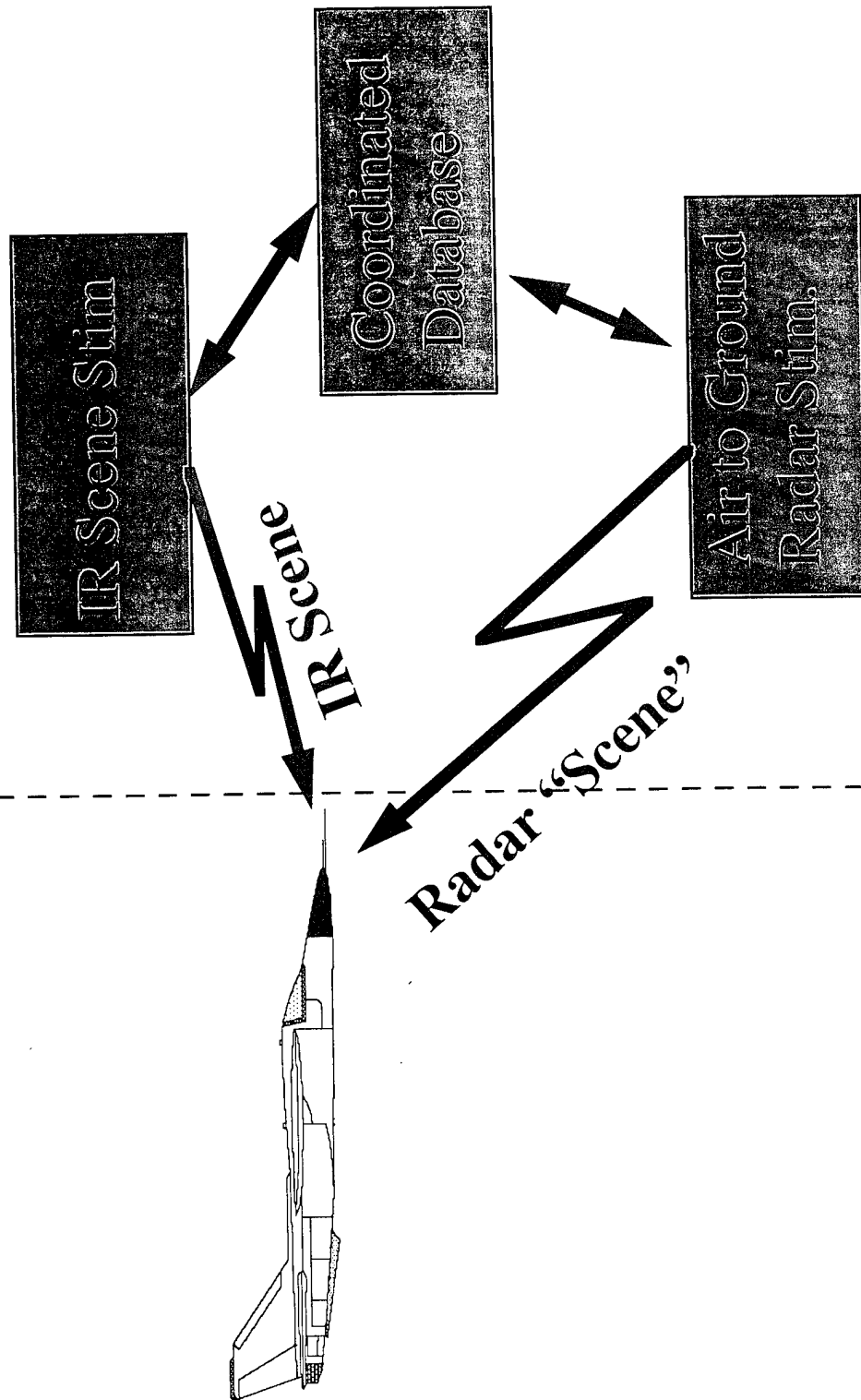




Offensive On-Board Air to Ground ACETEF Test Scenario

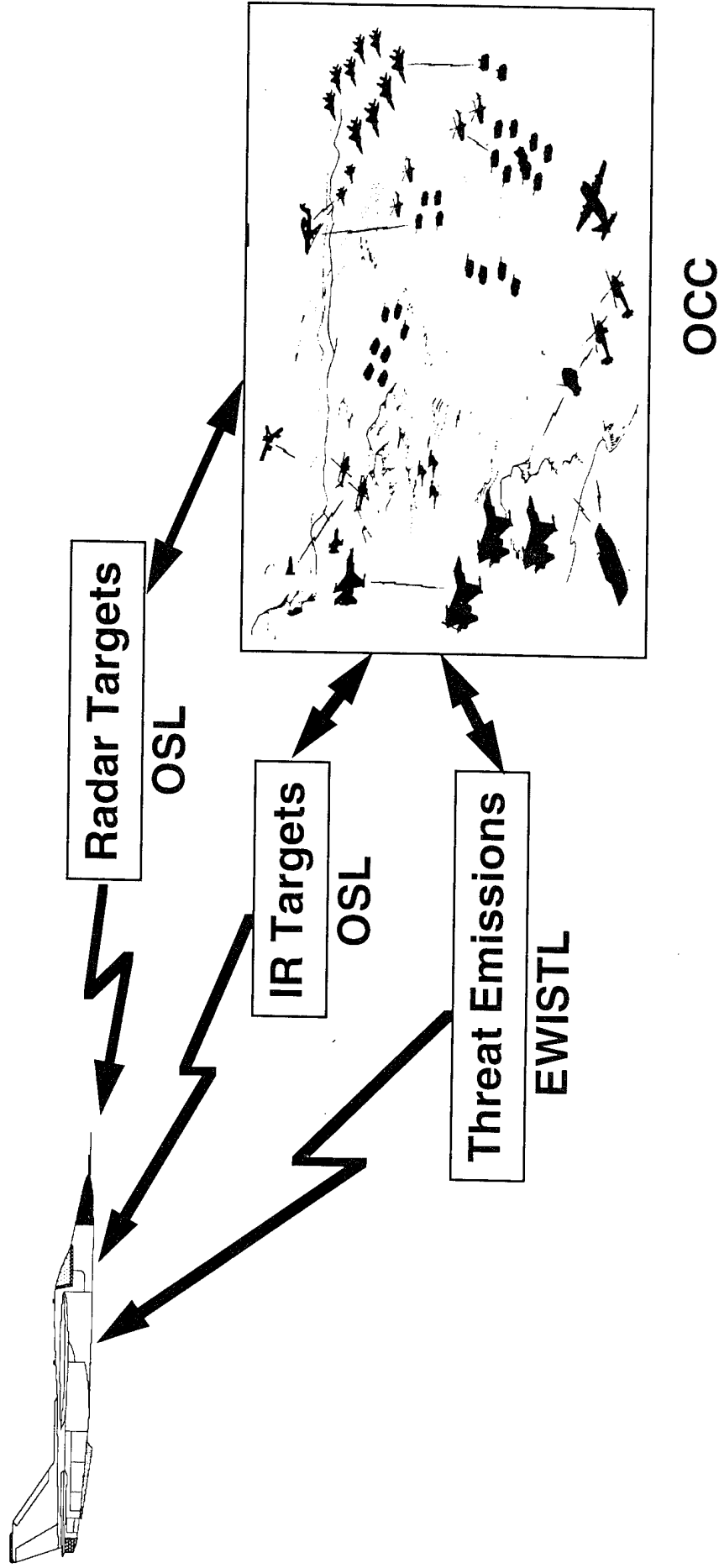


OSL





Offensive On-Board Air to Air ACETEF Test Scenario

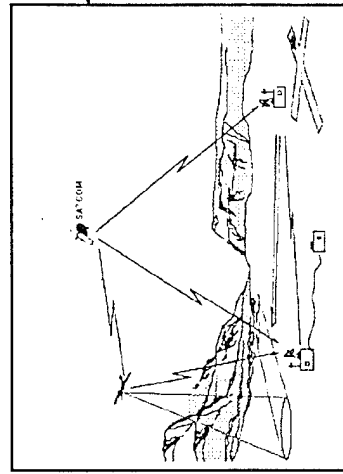




Offensive On-Board/Off-Board ACETEF Test Scenario



MFS/ASEF



OCC-SWEG

**Sensor Simulation
/Stimulation**

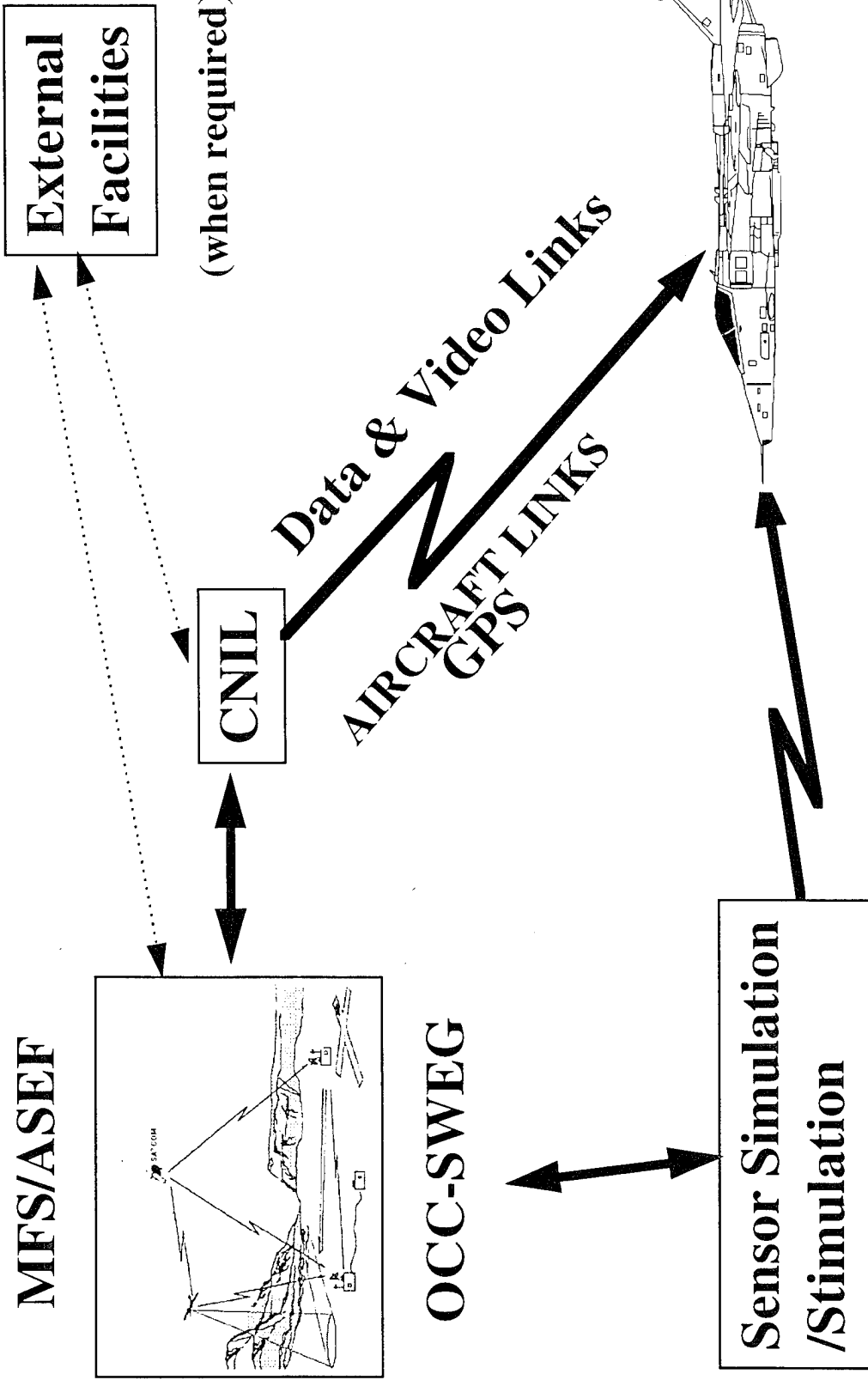
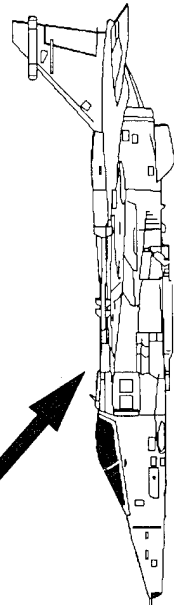
OSL - ASEF

**External
Facilities**

(when required)

CNIL

Data & Video Links
AIRCRAFT LINKS
GPS





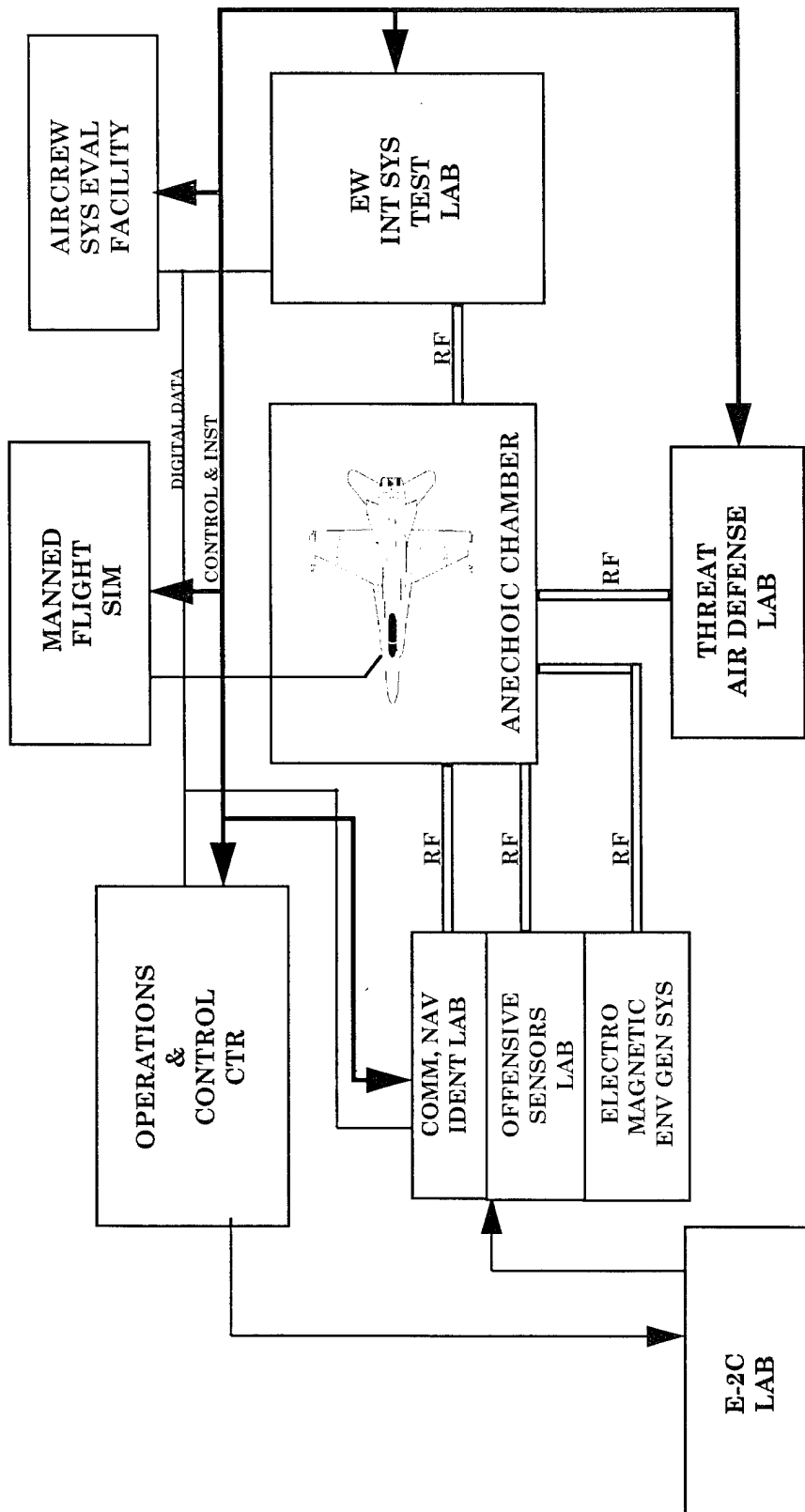
Distributed Simulation Examples



- Virtual Simulation & Stimulation--F/A-18 War at Sea
- Synthetic Theater of War-Europe
- KERNEL BLITZ - '95
- DMSO High Level Architecture Engineering Proto-Federation



Test Architecture



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Synthetic Theater of War-Europe Fall 1994



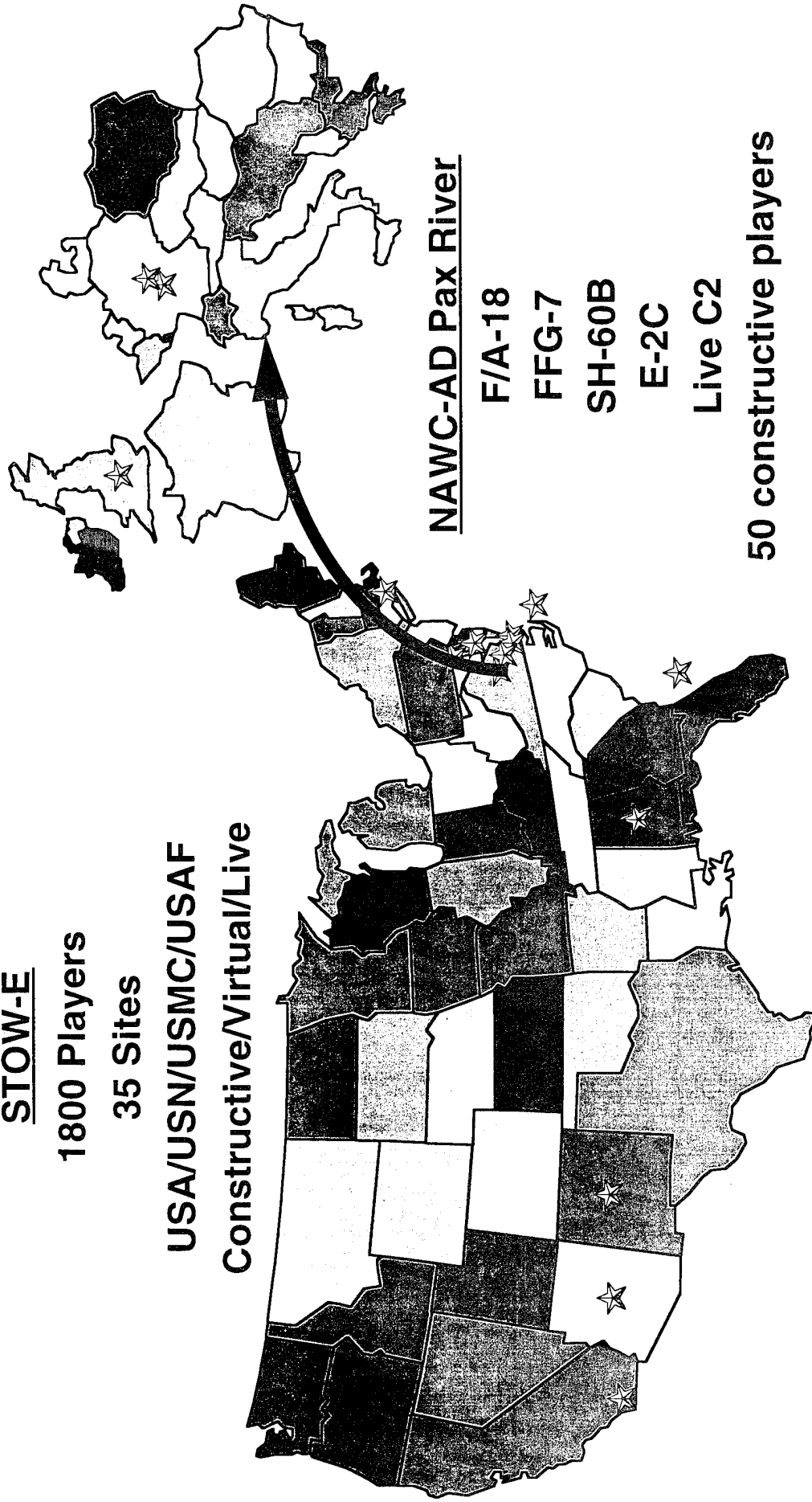
STOW-E

1800 Players

35 Sites

USA/USN/USMC/USAF

Constructive/Virtual/Live



NAWC-AD Pax River

F/A-18

FFG-7

SH-60B

E-2C

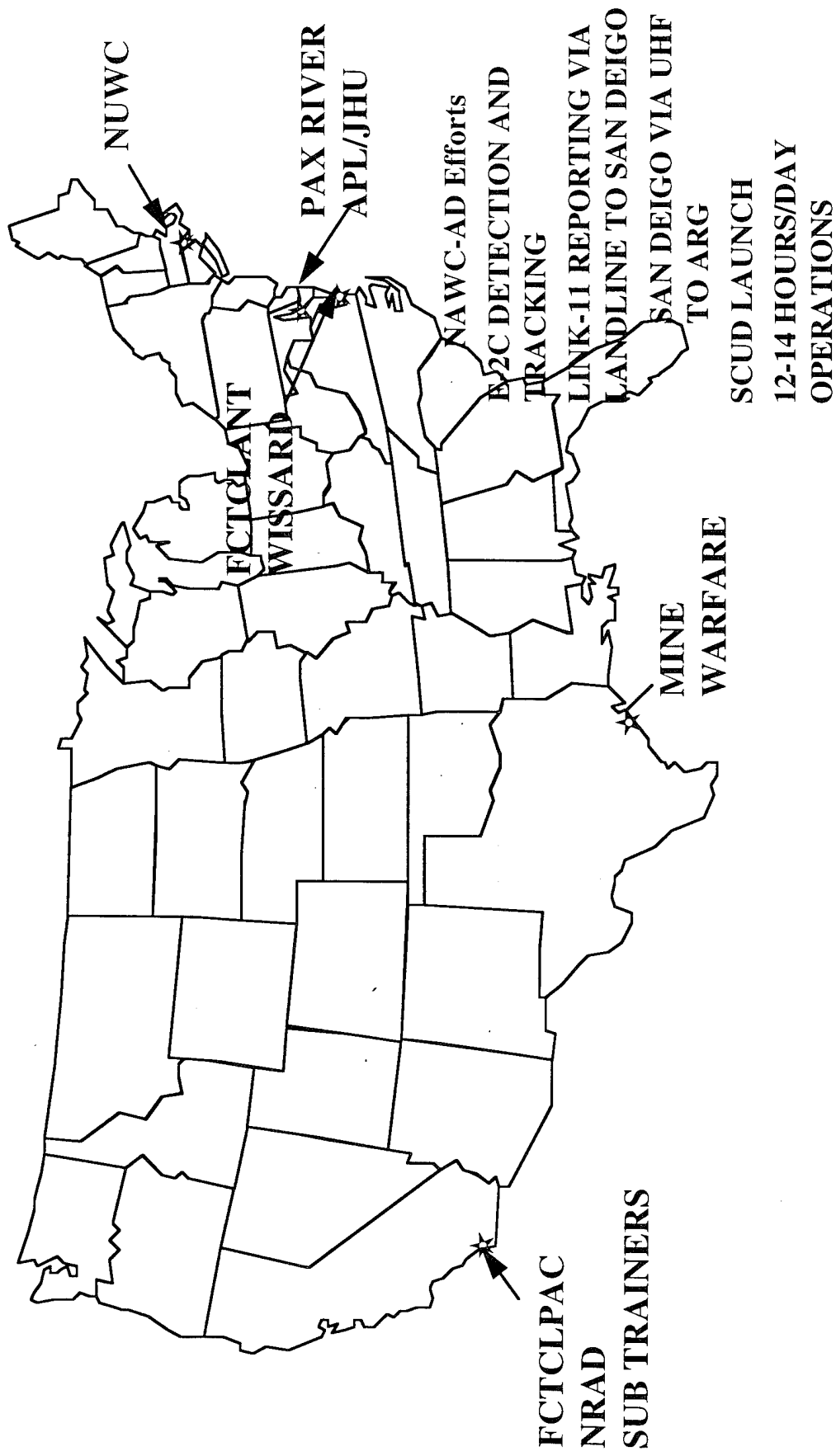
Live C2

50 constructive players

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KERNEL BLITZ SIMULATION SITES





DMSO High Level Architecture Engineering Protofederation Composition



- ACETEF (NAWCAD PAX)
 - SWEG
 - TADL
 - MFS
 - EWISTL
- AFEWES Fort Worth, Texas
- REDCAP, Buffalo, New York
- Chesapeake Test Range (NAWCAD PAX)
- Wright Lab (Dayton, Ohio)
 - JMASS
- MSIC (Redstone Arsenal, Alabama)
- Aberdeen Proving Ground
 - Simulation Based Design



Sensor Fusion Testing Examples in Distributed Simulatoin



- Airborne AAW Coordinator to Fighter
 - E-2C via voice and Link-4A
 - Hardware in the loop RWR
 - Simulated Radar
 - Visual Data
- E-2C, AEGIS, AWACS
 - Link - 11 (land line) and Voice
- E-2C, AEGIS, AWACS, Fighter
 - Link - 11 (land line), Link 4 (live) and Voice
 - Onboard Radar and visual (simulated)
- E-2C, AEGIS, SSN-688, FFG-7, SH-60B
 - Link-11, Lamps Data Link, Voice
- Link 11 Coordination with simulation assets and live assets engaged in at sea training exercise.



LIMITATIONS



- Fusion was performed manually
- IFF Simulation was limited
- Link quality, gridlock problems
- IFF simulation via DIS
- Limited C4I Simulation (Tactical Links only)
- Manual systems



Conclusions



ACETEF provides significant capabilities to support multi-sensor fusion efforts

Air to ground sensor fusion - longer term

ACETEF along with distributed simulation capabilities can support a wide variety of programs

T&E facilities can provide support to Training exercises

Training exercises provide a rich environment for conducting T&E

Still a long way to go!!!

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Wrap UP



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